

Interannual variability in satellite-based estimates of new production

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We present satellite-based estimates of oceanic new production, which represents the potential sink of carbon from the atmosphere to the deep ocean. The primary estimate is derived from the annual amplitude of heat storage anomaly measured by the TOPEX/Poseidon altimeter (T/P) and the inverse relationship between climatological measurements of the monthly storage of heat and nutrients. The global value is 4.8 Gt of carbon ($1 \text{ Gt} = 10^{15} \text{ g}$). We test the validity of the approach by comparing the new production from climatological heat storage changes to the climatological drawdown of nutrients. The reduced coverage of the filtered T/P measurement underestimates phosphate drawdown by 30%, thus increasing our global estimate to approximately 6.5 Gt C. Interannual variability is about 40% of the 7-year estimate, with global minima in 1993, 1995, and 1997. Year-to-year zonally-averaged variability is maximum poleward of 40°deg, weak in the equatorial band (10°degN--10°degS), and almost non-existent between 10 and 40°deg. We compare the T/P-based estimate with estimates derived from ocean color and sea surface temperature measurements. The T/P method is not well-suited to study continental margins or high latitudes. By incorporating the other sensors we attempt to quantify the impact of these regions to global carbon fluxes.